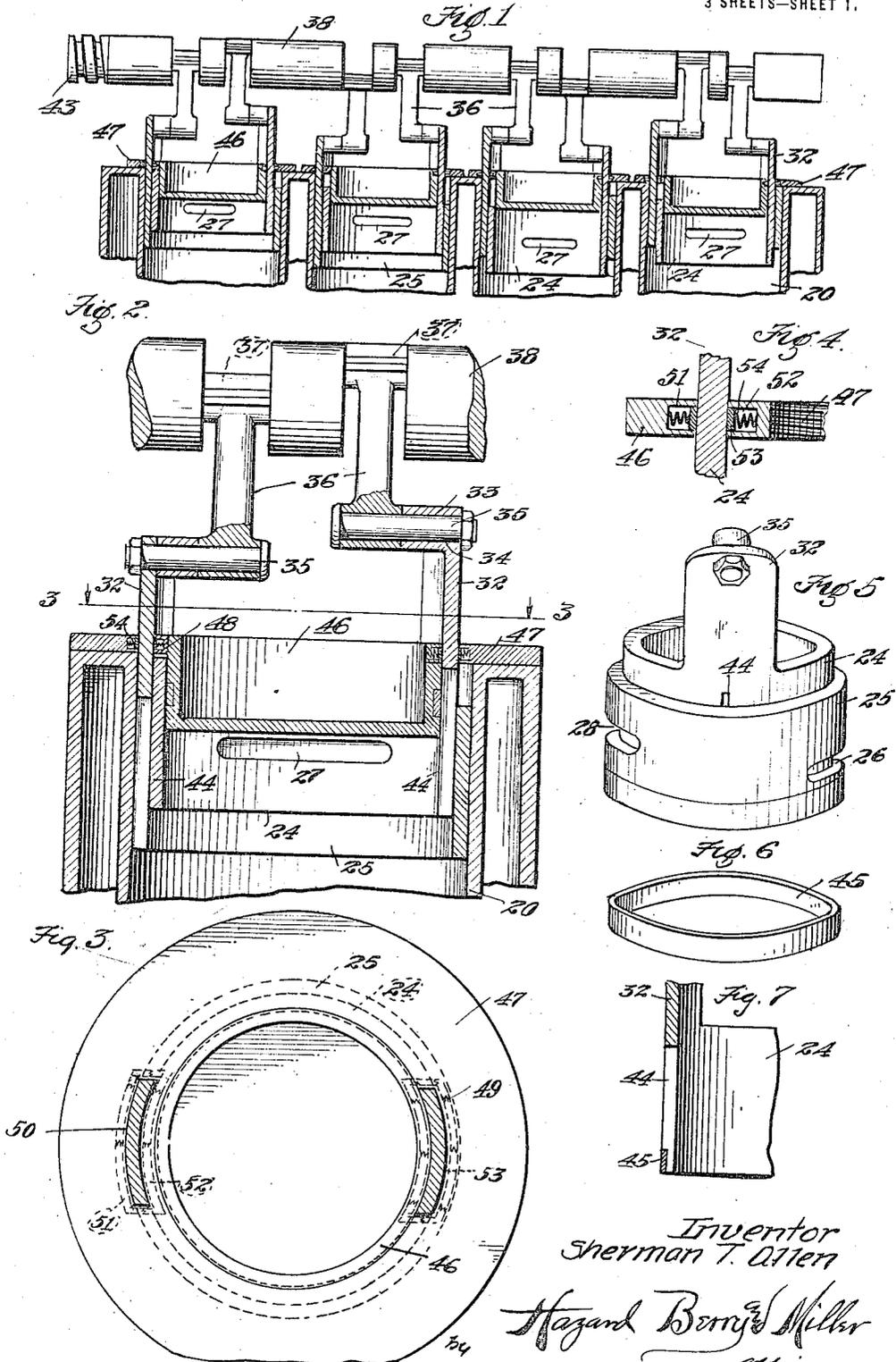


S. T. ALLEN.
 SLIDE VALVE FOR GAS ENGINES.
 APPLICATION FILED FEB. 16, 1916.

1,237,444.

Patented Aug. 21, 1917.
 3 SHEETS—SHEET 1.



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Fig. 8.

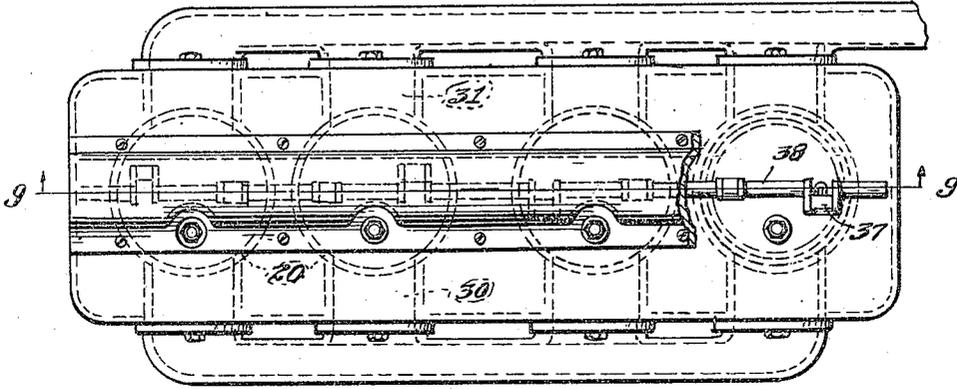
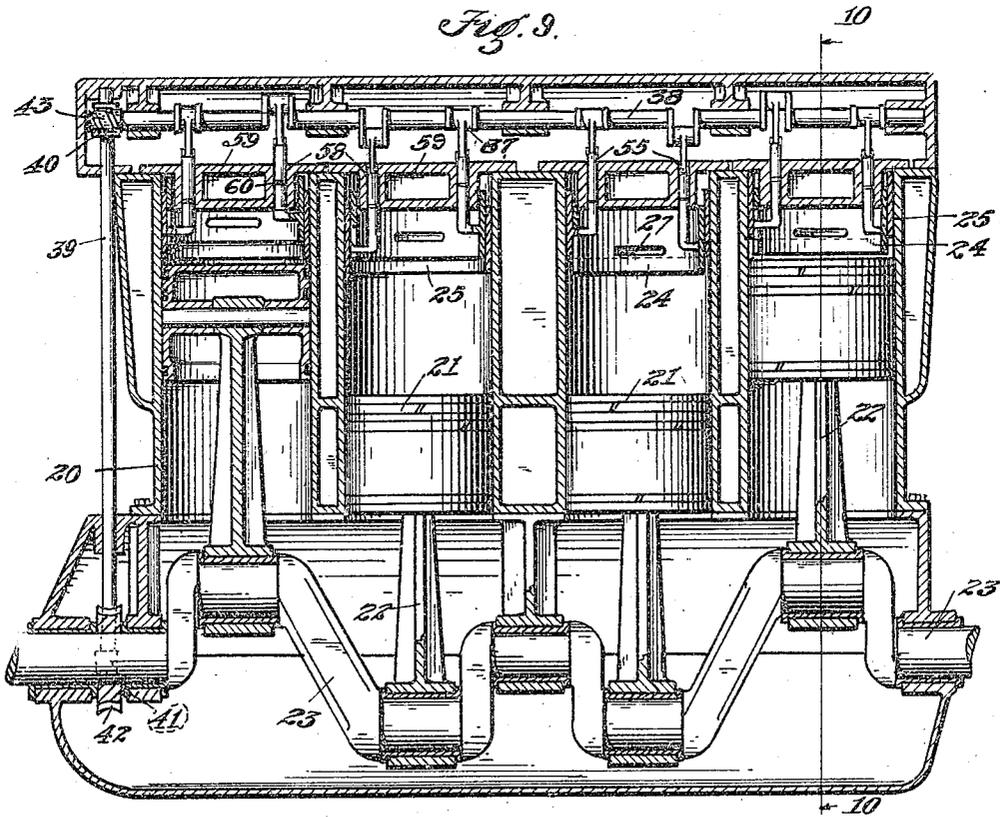


Fig. 9.



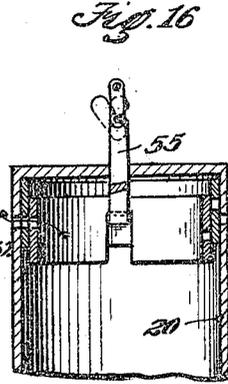
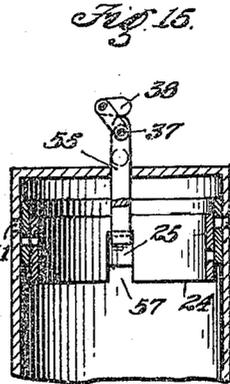
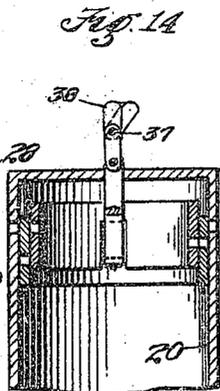
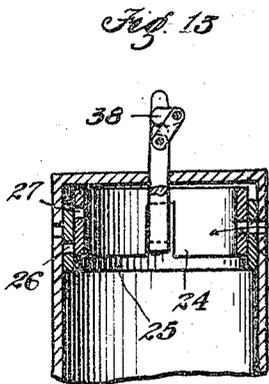
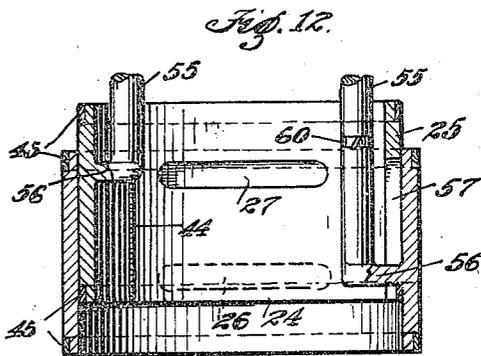
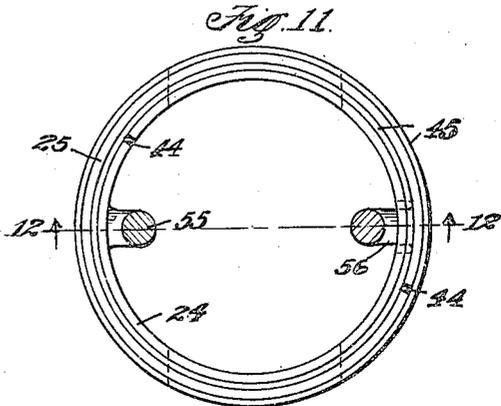
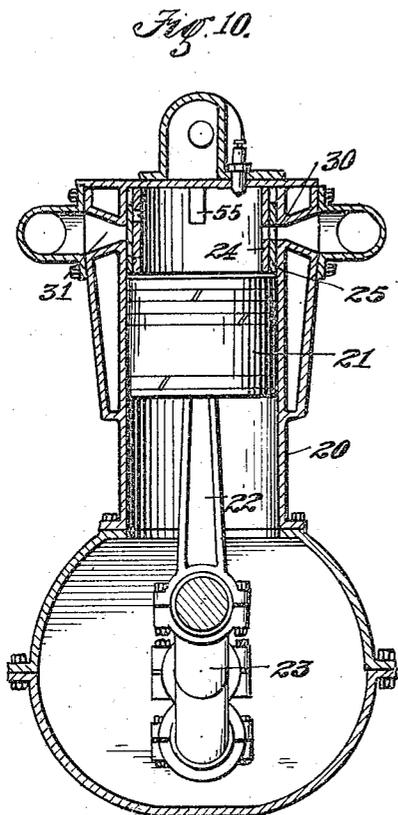
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UNITED STATES PATENT OFFICE.

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SLIDE-VALVE FOR GAS-ENGINES.

1,237,444.

Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed February 16, 1916. Serial No. 78,664.

To all whom it may concern:

Be it known that I, SHERMAN T. ALLEN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Slide-Valves for Gas-Engines, of which the following is a specification.

This invention relates to a slide valve for internal combustion engines and particularly pertains to a valve of the reciprocal sleeve type for controlling the intake and exhaust of an engine.

It is the object of this invention to provide a valve of the above type so constructed and arranged as to operate in the upper portion of an engine cylinder above and clear of an engine piston in the cylinder to alternately open and close intake and exhaust ports formed in the side walls of the engine cylinder adjacent the upper end thereof and which permits the removal and replacement of the valve without disturbing the engine piston or its connections.

Another object is to provide means whereby the slide valves may be actuated from a point above the engine cylinder.

Another object is to provide a simple and compact slide valve embodying a pair of telescoping relatively movable sleeve members having ports in their side walls adapted to register with each other and with intake and exhaust ports in the side walls of the engine cylinder and to also provide means for longitudinally reciprocating the sleeves in the direction of the stroke of the engine piston and in opposed directions in relation to each other.

Another object is to provide a construction in the valve sleeves to permit expansion and contraction thereof without causing a binding action.

A further object is to provide means for restricting the expansion of the valve sleeves.

While I have shown the invention as applied to an engine cylinder of sufficient length to accommodate the travel of the piston and the movement of the sliding sleeve members, it is an object to provide a set of said valves with their timing gears and the timing shaft mounted in a compact housing which may be readily applied to an engine of the T-head type without alteration of the engine save to remove and discard the old cylinder heads.

Other objects will appear hereinafter.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a view in vertical section and elevation showing my invention as applied to a four cylinder internal combustion engine.

Fig. 2 is an enlarged detail section more clearly showing the construction and arrangement of the slide valve.

Fig. 3 is a detail horizontal section and plan view as seen on the line 3—3 of Fig. 2.

Fig. 4 is an enlarged detail section, illustrating the manner of packing the valve stems.

Fig. 5 is a view of the valve in perspective, as removed.

Fig. 6 is a detail in perspective of the expansion restricting ring.

Fig. 7 is a detail in section and elevation showing the manner of splitting the valve sleeve to permit of expansion thereof without freezing to its encircling walls.

Fig. 8 is a plan view showing a modified form of the invention as applied.

Fig. 9 is a detail vertical section on the line 9—9 of Fig. 8.

Fig. 10 is a view in transverse section, as seen on the line 10—10 of Fig. 9.

Fig. 11 is a plan view showing the form of the valve disclosed in Fig. 9, as removed.

Fig. 12 is a detail in section and elevation on the line 12—12 of Fig. 11.

Figs. 13, 14, 15 and 16 are views in diagram illustrating the operation of the valve.

More specifically, 20 indicates an engine cylinder which may be mounted singly or in multiple in any suitable manner and which is fitted with a reciprocal piston attached to a piston rod 22 connecting with a crank shaft 23, as is common in internal combustion engine construction.

The present invention resides in a slide valve adapted to be mounted within the upper portion of the engine cylinder and above and clear of the piston 21. This slide valve embodies a pair of telescoping slidable sleeves 24 and 25 which are formed with transverse ports 26, 27, 28 and 29 arranged upon the sleeves in pairs and positioned on diametrically opposite sides thereof. The ports 26 and 28 are formed within the walls of the sleeve 25 in off-set relation to each other with port 28 on a plane higher than that of port 26, and ports 27 and 29 are formed within the walls of

sleeve 24 on different planes and in opposed staggered relation to the ports 26 and 28. The ports 26 and 27 are positioned in the same vertical line of travel and ports 28 and 29 are similarly arranged. In this manner it is possible for the pair of ports 26 and 27 to register at a given point in the travel of the sleeves and the ports 28 and 29 to register at another point; the registering of each pair of ports being alternate. By this arrangement when one set or pair of ports is in register the other overlaps, thus making it possible for a gas to enter or leave through but one side of the valve at a time. Further consideration of the above described ports has been given to arrange them in such relation to each other and to an inlet passage 30 and exhaust passage 31 formed through the cylinder walls, that but one set of ports is in register with one of these passages at a time, thus making it impossible for the engine to back-fire into the carbureter or the unburned gas to pass directly through the cylinder and out the exhaust manifold.

In the preferred form of my valve mechanism I have formed each of the sleeves with a vertically extending shank or stem 32 continuing from the sleeve wall, by which the sleeve may be reciprocated. The upper end of the shank is here shown as provided with a boss 33 within which is a bore 34 adapted to receive a wrist pin 35. The wrist pin 35 extends toward the center of the cylinder and is of sufficient length to permit one end of a pitman rod 36 to be mounted thereon. The opposite end of said rod is rotatably mounted upon a portion 37 of a timing shaft 38. It is manifest that the pitman rods may be otherwise connected to the sleeves. The shaft 38 extends the entire length of the engine and is positioned in suitable bearings approximately over the center of the cylinders. The portions 37 of said timing shaft are eccentric to the center of the shaft and are positioned at ninety degrees to each other as they are arranged the length of the shaft. The timing shaft is here shown as rotated by a vertically extending rod 39 which has mounted on its opposite ends worm gears 40 and 41 meshing with driving gear 42 mounted upon the main engine shaft and a driven gear 43 mounted upon the timing shaft.

It has been found that in constructing a pair of sliding sleeves of a length as short as embodied in my invention, it is very difficult to properly pack them without interfering with the travel of the ports along the engine cylinder and along the surfaces of each other. In the preferred form of my invention I have overcome this difficulty by discarding piston rings as in common use and in lieu thereof forming a vertically extending slot 44 approximately the width

of the ring and at a position along the center line of the shanks. In this manner I have made the sleeve resilient so that it will readily expand into its proper position and prevent leakage around the port. In order to limit the expansion of these sleeves and remove the danger of the sleeves expanding when heated and thus freezing to each other and to the cylinder wall, I have provided each sleeve with an expansion restricting ring 45. The expansion restricting ring 45 is a simple annular ring which is of a slightly reduced outside diameter in comparison with the diameter of the sleeve, thus insuring a sliding fit between it and the member in which it moves, even though it is expanded by the heat. This ring is shown in the preferred form of my invention as only being applied to the lower end of each sleeve. However, in the modification, it has been possible to split the sleeve entirely through and thus it has been necessary to apply one of said rings to the top and the bottom of each sleeve.

To obviate any tendency for gas to leak from the cylinder around the openings through which the shanks 32 pass, I have provided special packing and a special means of mounting the cylinder head 46. This means consists of a ring 47 which is securely bolted over the opening in the upper part of the cylinder. The internal diameter of said ring is threaded and adapted to receive a threaded portion 48 upon the outer diameter of the cylinder head. A recess 49 has been formed at one side of the ring to permit the shank 32 of the sleeve 24 to have free travel therethrough. An arcuate slot 50 is formed diametrically opposite to slot 49 for the accommodation of the shank on sleeve 25. In order to securely pack these shanks, channels have been formed, as indicated at 51 and 52, these channels being of sufficient width to allow a packing member 53 to be inserted therein. The packing members are held resiliently against the shank by means of springs 54. In this manner any tendency for the gas to leak around the shank is eliminated.

In the modified form of my invention the sleeves are formed substantially the same as previously described. However, the shanks by which the sleeves are oscillated are not formed as a continuation of the sleeve walls. In this form these shanks are substantially cylindrical as indicated at 55, an off-set portion 56 connecting them to the interior of each sleeve. I have here shown them as integral with the sleeve. They, however, may be formed of separate parts and secured thereto. With this form of construction it has been found necessary to slot the inner sleeve as indicated at 57, to allow the movement of the portion 56 of sleeve 25 therein. The shanks are packed

within glands 58 of the cylinder head 59 by means of small piston rings 60 which insure the cylinder against leakage as the shanks travel up and down.

5 In the operation of this slide valve, the timing shaft is mounted over the engine cylinders as particularly shown in Figs. 1 and 9 and is driven by the worm gears. These gears are proportioned so as to allow
10 the valves to act in synchronism with the cylinder and may be changed to accommodate the timing of engines of various numbers of cylinders. The throws on the timing shaft are so arranged that they will permit
15 the slide valves in each cylinder to register each set of ports alternately with their respective intake or exhaust manifolds in the manner as is common in four-cycle engine construction. It will thus be seen that the
20 valves will operate to cause the engine to explode in each of its cylinders as is common and that any expansion of the sleeve members will be limited by the expansion rings which are of such an inside diameter as to
25 prevent the sleeve members freezing in position.

30 While I have shown the preferred forms of my slide valve as now known to me, it is evident that various changes therein may be made by those skilled in the art without

departing from the spirit of the invention as set forth in the appended claims.

What I claim is:

1. In a slide valve for internal combustion engines, the combination of a pair of
35 telescoping slidable sleeves, a slot extending a portion of the way through the width of said sleeves, and an expansion restricting ring adapted to be mounted upon each of
40 said sleeves.

2. In an internal combustion engine, an engine cylinder having a reciprocal piston
45 therein, a cover for the upper end of the cylinder having an annular inwardly projecting portion spaced from the inner wall of the cylinder, a pair of telescoping slidable sleeves mounted adjacent the cover and
50 adapted to extend into the space between the projection on the cover and the wall of the cylinder and arranged above the uppermost position of the piston, said sleeves having ports adapted to register with each
55 other and with ports in the engine cylinders, pitman rods connected to said sleeves, and means operating on said pitman rods for reciprocating the sleeves independent of each other.

In testimony whereof I have signed my name to this specification.

SHERMAN T. ALLEN.